

Original Research Article

Hypovitaminosis D in adult patients scheduled for orthopaedic surgery: a cross-sectional and observational study

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ABSTRACT

Background: Hypovitaminosis D is a common yet underdiagnosed nutritional deficiency with significant implications for orthopaedic surgical patients. Vitamin D plays a critical role in calcium homeostasis, bone metabolism, and muscle function—factors influencing bone healing, infection risk, and postoperative rehabilitation. Although global studies report high prevalence, limited Indian data exist for orthopaedic surgery patients.

Methods: A cross-sectional observational study was conducted in the Department of Orthopaedics, Government Medical College, Jammu, from September 2023 to February 2024. Fifty adult patients (>20 years) scheduled for elective orthopaedic surgery were included. Serum 25-hydroxyvitamin D (25(OH)D) levels were measured preoperatively using liquid chromatography–tandem mass spectrometry. Deficiency was defined as <20 ng/ml, insufficiency as 20–30 ng/ml, and optimal as >30 ng/ml. Demographic and clinical variables (age, sex, BMI) were recorded. Ethical clearance was obtained from the Institutional Ethics Committee (approval no. GMCJ/IEC/2023/241).

Results: Mean age was 56.17±15.23 years; 58% were male. Mean body mass index (BMI) was 25.61±4.21 kg/m², with 38% overweight. Vitamin D deficiency was present in 30% of patients, insufficiency in 40%, and optimal levels in 30%. Deficiency was more prevalent among males and overweight individuals, and highest in the 61–70-year age group (38%).

Conclusions: Hypovitaminosis D is highly prevalent among adults undergoing orthopaedic surgery. Overweight status and male gender were associated with higher risk. Routine preoperative screening and supplementation could improve surgical outcomes and reduce complications.

Keywords: Hypovitaminosis D, Orthopaedic surgery, Vitamin D deficiency, Bone healing, BMI, Preoperative screening

INTRODUCTION

Vitamin D deficiency, or hypovitaminosis D, is an increasingly recognized public health issue worldwide, affecting over one billion people.¹ Vitamin D is essential for calcium balance, bone health, and muscle function. Approximately 90% of the body's vitamin D is synthesized in the skin upon exposure to sunlight, where

ultraviolet B (UVB) rays convert 7-dehydrocholesterol to pre-vitamin D₃, later transformed into cholecalciferol (vitamin D₃).² Dietary sources provide vitamin D₂ (ergocalciferol). Both forms are hydroxylated in the liver to form 25-hydroxyvitamin D (25(OH)D), and subsequently in the kidney to produce the biologically active hormone 1,25-dihydroxyvitamin D (calcitriol).³

The recommended daily intake for adults is 400–800 IU.⁴ Serum 25(OH)D levels <20 ng/ml are considered deficient, 20–30 ng/ml insufficient, and >30 ng/ml optimal.⁵ Deficiency is prevalent among hospitalized patients, nursing home residents, obese individuals, and older adults.⁶ In India, studies have reported widespread deficiency, with Marwaha et al noting a prevalence of 53.4% in Jammu and Kashmir.⁷

In the orthopaedic context, adequate vitamin D is vital for fracture healing, implant fixation, and reducing complications such as infections or non-union.⁸ Several international studies have reported high rates of deficiency in orthopaedic surgical populations, but Indian data remain scarce.^{9,10}

The present study aims to assess the prevalence of hypovitaminosis D in adult orthopaedic surgery patients and identify associated demographic factors.

METHODS

Study design and setting

This cross-sectional observational study was conducted at the Department of Orthopaedics, Government Medical College, Jammu—a tertiary care centre in North India—from September 2023 to February 2024.

Ethical approval

Institutional ethics committee clearance was obtained prior to study initiation (approval no. GMCJ/IEC/2023/241). Written informed consent was obtained from all participants.

Inclusion criteria

Inclusion criteria included participants aged >20 years, scheduled for elective orthopaedic surgery and medically fit for surgery.

Exclusion criteria

Exclusion criteria included individual aged ≤20 years, severe medical comorbidities (e.g., chronic liver disease, advanced CKD) and incomplete laboratory records.

Data collection

Demographic data (age, sex), body mass index (BMI), and serum 25(OH)D levels were recorded. BMI categories included- normal: 18.5–24.9 kg/m², overweight: 25.0–29.9 kg/m² and obese: ≥30 kg/m².

Laboratory analysis

Serum 25(OH)D was measured preoperatively using liquid chromatography–tandem mass spectrometry in the hospital laboratory.

Definitions involved deficiency: <20 ng/ml, insufficiency: 20–30 ng/ml and optimal: >30 ng/ml.⁵

Statistical analysis

Data were analysed using statistical package for the social sciences (SPSS) v26.0. Continuous variables were expressed as mean ± standard deviation. Categorical variables were expressed as frequencies and percentages. A p<0.05 was considered statistically significant.

RESULTS

Demographics

The mean age was 56.17±15.23 years (range: 42–74). Of the 50 patients, 29 (58%) were males and 21 (42%) females. The highest prevalence of patients was in the 61–70-year age group (Table 1).

Table 1: Demographics.

Age group (years)	Number (%)
40–50	9 (18)
51–60	16 (32)
61–70	19 (38)
71–80	6 (12)

BMI distribution

Mean BMI was 25.61±4.21 kg/m²; 38% were overweight, and 22% obese (Table 2). Nearly 60% were overweight or obese, groups that showed higher deficiency prevalence.

Table 2: BMI distribution.

BMI category (kg/m ²)	Number (%)
18.5–24.9	20 (40)
25–29.9	19 (38)
≥30	11 (22)

Vitamin D status

Overall, 30% had deficiency, 40% insufficiency, and 30% optimal levels (Table 3). 70% of patients had suboptimal vitamin D levels.

Table 3: Vitamin D status.

Vitamin D category	Number (%)
Optimal (>30 ng/ml)	15 (30)
Insufficiency (20–30 ng/ml)	20 (40)
Deficiency (<20 ng/ml)	15 (30)

DISCUSSION

This study was found a 70% prevalence of suboptimal vitamin D levels in orthopaedic surgical patients, aligning with Bogunovic et al, who reported 73% deficiency/

insufficiency in the US. The 30% outright deficiency rate in our cohort is slightly higher than the 26% reported by Glowacki et al in arthroplasty patients.^{9,10}

Age and sex trends

Deficiency was more common in the 61–70-year age group, consistent with Guardia et al, who noted higher prevalence in older adults due to reduced skin synthesis and mobility limitations.¹¹ Males showed slightly higher deficiency rates than females, a finding that contrasts with some studies, suggesting possible regional or lifestyle influences.¹²

BMI and vitamin D status

The data support prior reports that overweight and obese individuals have lower bioavailable vitamin D due to sequestration in adipose tissue.¹³

Clinical implications

Deficiency may impair bone healing, increase infection risk, and delay rehabilitation.¹⁴ Given these risks, routine screening and supplementation should be considered, especially for high-risk subgroups.

Limitations

This study is limited by its small sample size, single-centre design, and lack of seasonal variation assessment. Future multicentric studies with larger cohorts are recommended.

CONCLUSION

Hypovitaminosis D is highly prevalent among adult orthopaedic surgery patients in North India, especially in overweight males and older adults. Preoperative screening and correction should be integrated into surgical protocols to optimize outcomes.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Kaur J, Khare S, Sizar O, Givler A. Vitamin D Deficiency. 2025. In: StatPearls. Treasure Island (FL): StatPearls Publishing. 2025.
2. Holick MF. Vitamin D: Importance in the prevention of cancers, type 1 diabetes, heart disease, and osteoporosis. *Am J Clin Nutr.* 2004;79(3):362-71.
3. DeLuca HF. Overview of general physiologic features and functions of vitamin D. *Am J Clin Nutr.* 2004;80:1689S-96S.
4. Institute of Medicine (US) Committee to Review Dietary Reference Intakes for Vitamin D and Calcium. Dietary Reference Intakes for Calcium and Vitamin D. Ross AC, Taylor CL, Yaktine AL, Del Valle HB, editors. Washington (DC): National Academies Press (US). 2011.
5. Holick MF, Binkley NC, Bischoff-Ferrari HA, Gordon CM, Hanley DA, Heaney RP, et al. Evaluation, treatment, and prevention of vitamin D deficiency: An Endocrine Society guideline. *J Clin Endocrinol Metab.* 2011;96(7):1911-30.
6. Lips P. Worldwide status of vitamin D nutrition. *J Steroid Biochem Mol Biol.* 2010;121:297-300.
7. Marwaha RK, Tandon N, Garg MK, Kanwar R, Narang A, Sastry A, et al. Vitamin D status in healthy Indians aged 50 years and above. *J Assoc Physicians India.* 2011;59:706-9.
8. Binkley N, Novotny R, Krueger D, Kawahara T, Daida YG, Lensmeyer G, et al. Low vitamin D status despite abundant sun exposure. *J Clin Endocrinol Metab.* 2007;92(6):2130-5.
9. Bogunovic L, Kim AD, Beamer BS, Nguyen J, Lane JM. Hypovitaminosis D in patients scheduled to undergo orthopaedic surgery: a single-center analysis. *J Bone Joint Surg Am.* 2010;92(13):2300-4.
10. Glowacki J, Hurwitz S, Thornhill TS, Kelly M, LeBoff MS. Osteoporosis and vitamin-D deficiency among postmenopausal women with osteoarthritis undergoing total hip arthroplasty. *J Bone Joint Surg Am.* 2003;85(12):2371-7.
11. Guardia G, Parikh N, Eskridge T, Phillips E, Divine G, Rao DS. Prevalence of vitamin D depletion among subjects seeking advice on osteoporosis: a five-year cross-sectional study with public health implications. *Osteoporos Int.* 2008;19(1):13-9.
12. Foo LH, Zhang Q, Zhu K, Ma G, Trube A, Greenfield H, et al. Relationship between vitamin D status, body composition and physical exercise of adolescent girls in Beijing. *Osteoporos Int.* 2009;20(3):417-25.
13. Wortsman J, Matsuoka LY, Chen TC, Lu Z, Holick MF. Decreased bioavailability of vitamin D in obesity. *Am J Clin Nutr.* 2000;72(3):690-3.
14. Maier GS, Maus U, Lazovic D, Horas K, Roth KE, Kurth AA. Is there an association between low serum 25-OH-D levels and the length of hospital stay in orthopaedic patients after arthroplasty? *J Orthop Traumatol.* 2016;17(4):297-302.

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